

Practice paper – 4

Topic – Basic BJT Amplifiers

1. Consider the following common-emitter amplifier circuit (Figure 1). Estimate the Q-point, small signal voltage gain, input and output resistances. Given that $\beta = 65$ and $V_A = 50$ V. Assume $V_{BE_{ON}} = 0.7$ V.

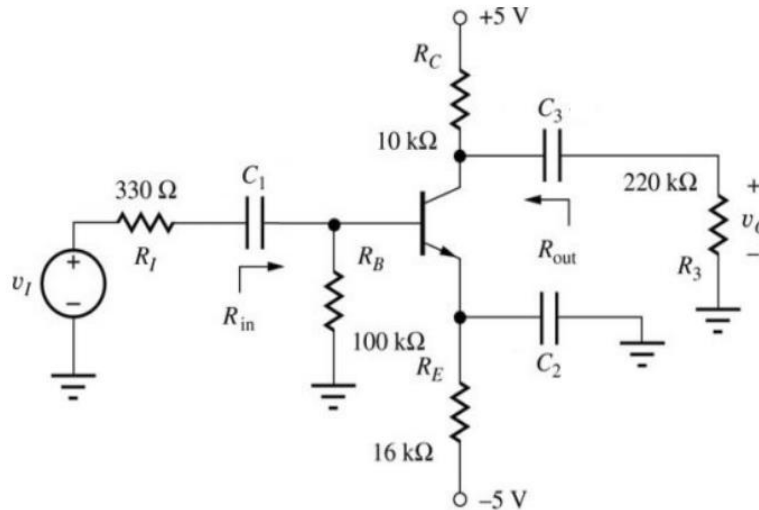


Figure 1

2. For the following amplifier circuit (shown in Fig. 2) the Si BJT has $\beta = 200$ and $V_A = 150$ V.

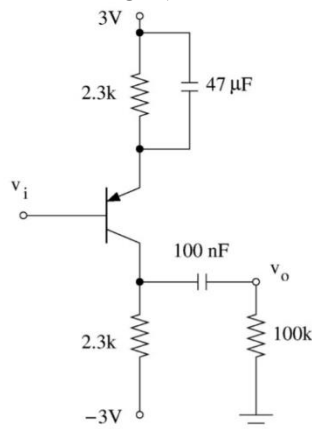


Figure 2

- Calculate I_C , I_B , I_E , V_{EC} . You can ignore the Early effect in DC bias calculations.
- Draw the AC equivalent circuit and determine the AC model parameters.
- Calculate the voltage gain.

3. Find the bias point, the amplifier parameters and the gain of the circuit shown below (Fig. 3)
Consider the Si BJT has $\beta = 200$ and Early voltage (V_A) = 150 V. You can ignore Early effect in DC bias calculations.

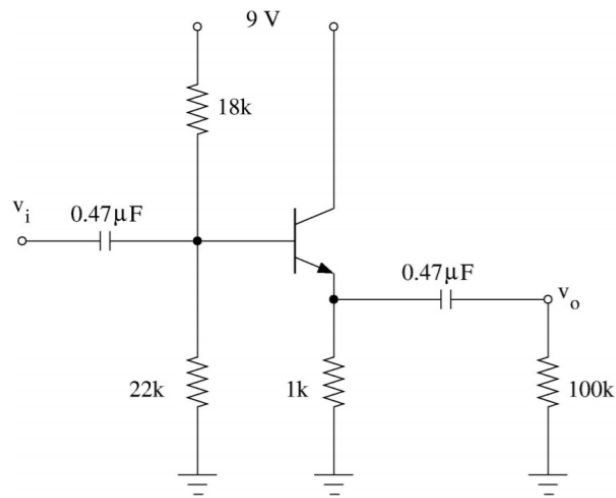


Figure 3

4. The transistor parameters for the circuit in Figure 4 are $\beta = 120$ and $V_A = \infty$.
(a) Find I_{CQ} and V_{CEQ} .
(b) Plot the dc and ac load lines.
(c) Find the maximum swing of collector current.
(d) Calculate the small-signal voltage gain.
(e) Determine the input and output resistances R_{ib} and R_o as shown in the figure.

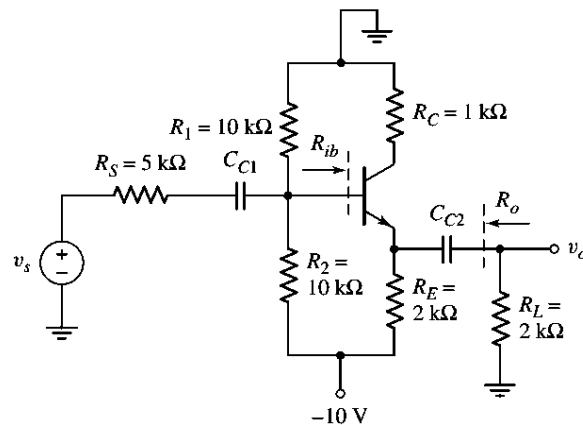


Figure 4

5. The parameters of the transistor in the circuit in Figure 5 are $\beta = 100$ and $V_A = 100$ V.

(a) Find the dc voltages at the base and emitter terminals.

(b) Find R_C such that $V_{CEQ} = 3.5$ V.

(c) Assuming C_C and C_E act as short circuits, determine the small-signal voltage gain $A_v = v_o/v_s$.

(d) Repeat part (c) if the magnitude of source resistance (R_S) is changed to 500Ω .

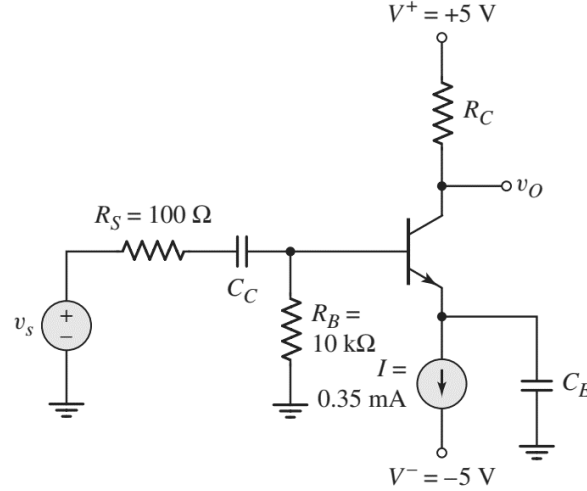


Figure 5

6. Find the expression of small signal voltage gain for the following circuit (Figure 6)

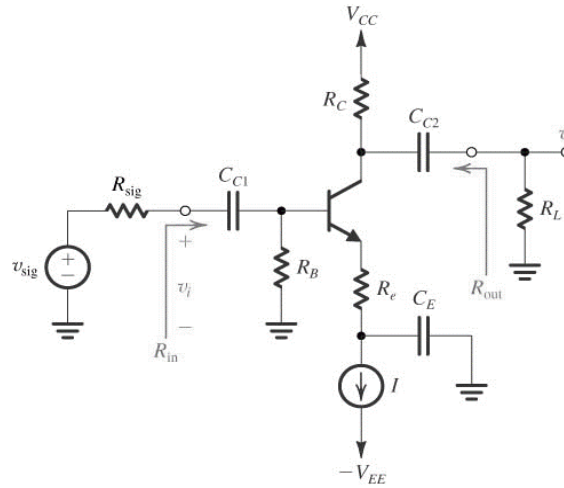


Figure 6